

·信息研究·

Wells 量表和修正的 Geneva 评分对肺栓塞的预测价值

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摘要:【目的】为减少肺栓塞误漏诊,探讨并应用受试者工作特征曲线(ROC)比较修正的 Geneva 和 Wells 评分系统对肺栓塞的预测价值。【方法】收集 1998-2008 年 10 月中山大学附属第三医院可疑肺栓塞 65 例,其中临床确诊肺栓塞 44 例,记录、归纳整理、统计分析,应用 ROC 曲线比较 Geneva 和 Wells 评分对肺栓塞的预测价值。【结果】Wells 评分 < 2 分肺栓塞可能性 33.3%(8/24),2 ~ 6 分 87.2%(34/39),6 分以上 100%(2/2),评分增加肺栓塞可能性增大($P = 0.000$);Geneva 评分:0 ~ 3 分肺栓塞可能性 22.2%(4/18);4 ~ 10 分 82.1%(32/39); ≥ 11 分 100%(8/8)。肺栓塞可能性与 Geneva 评分高低有关($P = 0.000$)。Wells 评分预测肺栓塞的 ROC 曲线下面积(AUC) 0.785 ± 0.060 ($P = 0.000$),最佳分界值 2 分,以 ≥ 2 分预测肺栓塞,其敏感性 81.8%,特异性 76.2%;Geneva 评分 ROC 的 AUC 为 0.900 ± 0.038 ($P = 0.000$),最佳分界值 6.5 分,以 ≥ 6.5 分预测的敏感性为 72.7%,特异性 100%;两条曲线所对应 AUC 的差异有统计学意义($P < 0.05$)。【结论】Wells 评分和 Geneva 评分对肺栓塞的预测均具有较好的临床价值;Geneva 评分的敏感性和特异性总体上优于 Wells 评分。

关键词: 肺栓塞; 预测; Wells 评分; Geneva 评分

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Predication of Wells and Revised Geneva Scores for Pulmonary Embolism

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Abstract:【Objective】To reduce misdiagnosis and underdiagnosis rate of pulmonary embolism, the prediction of the revised Geneva score and Wells score for pulmonary embolism were compared and analyzed by receiver operating characteristic curves.【Methods】Sixty-five cases with suspected pulmonary embolism (PE) were collected in the Third Affiliated Hospital of SUN Yat-sen University from January 1998 to October 2008. Of which 44 cases with PE were clinically confirmed. Relevant clinical data were recorded, summarized and the analysis variables were input to SPSS11.0 for statistical analysis. ROC curves was used to evaluate the probability of PE predicted by the Wells and the revised Geneva scores.【Results】Twenty-four patients had a low clinical probability of PE (Wells score < 2 points), of which 8 (33.3%) had proven PE. The prevalence of PE was 87.2% in the 39 patients with intermediate probability (2-6 points) and 100% in the 2 patients with high probability (> 6 points) ($P = 0.000$). The confirmed PE was 22.2% in the 18 patients with a low probability (Geneva score 0-3 points), 82.1% (32/39) in intermediate probability (4-10 points), 100% (8/8) in high probability (score ≥ 11 points) ($P = 0.000$). The area under curve (AUC) of the ROC curve in the Wells and Geneva scores was 0.785 ± 0.060 and 0.900 ± 0.038 , respectively ($P = 0.000$). The optimal cutoff value was 2 points in the Wells score and 6.5 points in the Geneva score. The Wells score more than 2 points predicted PE with a sensitivity of 81.8% and specificity of 76.2%.The Geneva score more than 6 points predicted PE with a sensitivity of 72.7% and specificity of 100%. The comparison of the area under curve between the Wells and the Geneva score had a significant difference statistically ($P < 0.05$).【Conclusion】The Wells score and the revised Geneva score are beneficial to predict pulmonary embolism. The revised Geneva score is roughly superior to the Wells score both in sensitivity and specificity.

Key words: pulmonary embolism; predict; Wells score; Geneva score

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静脉血栓栓塞症(venous thromboembolism, VTE)是临床常见的全身性疾病,美国每年超过50万例肺栓塞(pulmonary embolism, PE)病人,接近2万人死亡^[1-2]。根据1994-2004年发表的110篇文献报道的1540例肺栓塞病例被误诊,致使对症治疗平均延误1.86年^[3]。最近10年,高分辨率螺旋CT肺动脉造影已经替代介入肺动脉造影,并被推荐为首选的肺栓塞诊断方法^[4]。然而复杂和昂贵的CT检查并不适合于严重疾病的病人,包括卧床、不能搬动或者机械通气,还有基层医院或急诊科。临床评估模型被用来预测肺栓塞或深静脉血栓形成的(deep venous thrombosis, DVT)可能性,减少了有创检查和医疗负担^[5-10]。目前比较公认的Geneva评分和Wells评分预测肺栓塞具有相对满意的结果。回顾分析我院65例可疑肺栓塞患者,分析两种评分系统与肺栓塞的关联性,运用受试者工作特征(receiver operating characteristic, ROC)曲线评价其对肺栓塞预测的准确程度。

1 材料和方法

1.1 临床资料

收集1998年至2008年中山大学附属第三医院临床可疑肺栓塞病人65例,其中确诊肺栓塞44例:男26例,女18例;年龄19~91岁,平均61($S=15$)岁,死亡10例。基础疾病依次为恶性肿瘤31.82%,DVT 11.36%、糖尿病9.09%、高血压病9.09%、冠心病6.82%、脑出血4.55%、骨折6.82%、风心病2.27%、肝硬化2.27%和无基础病占15.91%;排除可疑肺栓塞21例:男13例,女8例,年龄19~75岁,平均50($S=13$)岁,基础疾病为恶性肿瘤5例,肺炎5例,脑出血3例,肝炎3例,尿毒症2例,DVT 2例,妊娠肝炎1例。

记录年龄、性别、入院诊断(误诊疾病)、住院科室、起病至诊断时间,主要症状和体征,危险因素,基础疾病,下肢水肿或者有疼痛,D-二聚体,CTPA结果,彩超结果,治疗方法及其转归。根据Geneva和Wells量表评分对所有肺栓塞可疑和确诊患者评分。

1.2 深静脉血栓形成和肺栓塞的诊断方法

所有入选病例均符合中华医学会呼吸病学分会“肺血栓栓塞症诊断与治疗指南(草案)”诊断标准^[11]。深静脉血栓形成通过连续波多普勒、

探头加压、B型彩超;CTV或通气灌注下肢深静脉核素显像;肺栓塞诊断分别通过肺动脉造影、CTPA、肺通气灌注扫描或灌注扫描提示高度可能。常规心电图,胸片,ELISA法检测D-二聚体、动脉血气、生化、血常规和凝血常规等。其中疑诊标准为:不明原因的呼吸困难、胸痛、晕厥、休克或伴有单侧或双侧不对称性下肢肿胀、疼痛;D-二聚体 $>500\mu\text{g/L}$;动脉血气提示低氧血症;心电图:电轴右偏,极度顺钟向转位,有典型SIQ III T III改变;胸片:区域性肺纹理稀疏或消失,肺野透亮度增加;右下肺动脉增宽或截断,肺动脉段膨隆及右心室扩大,尖端指向肺门的楔形影或合并胸腔积液;超声心动图:右心室扩大或局部运动减弱,室间隔左移和运动异常,近端肺动脉扩张,肺动脉高压;下肢深静脉血栓超声阳性。排除标准:D-二聚体 $<500\mu\text{g/L}$ 、慢性血栓栓塞性肺动脉高压和不能搬动施行肺栓塞确诊检查的患者予以排除。

1.3 修正的Geneva量表评分标准

①年龄 >65 (1分);②以前有DVT/PE(3分);③1月内手术(全麻)骨折(下肢)(2分);④恶性肿瘤(实体或血液,目前活动或者1年内治愈)(2分);⑤单侧下肢疼痛(3分);⑥咯血(2分);⑦心率75~94(3分);⑧心率 >95 (5分);⑨下肢深静脉触痛及单侧水肿(4分)。临床解释:肺栓塞可能性,低度0~3分,中度4~10分,高度 ≥ 11 分^[12]。较原有的评分标准^[13]进行重要修正:危险因素中新增恶性肿瘤;症状体征增加单侧下肢痛、咯血和下肢深静脉触痛和单侧水肿;取消原有的血气分析结果和胸片结果。

1.4 Wells量表评分标准

①癌症活动(1分);②卧床不起或4周内有过大手术(1.5分);③咯血(1分);④既往DVT/PE病史(1.5分);⑤心率 >100 次/min(1.5分);⑥除肺栓塞外其它诊断可能性小(3分);⑦临床有DVT的症状和体征(3分)。临床解释:肺栓塞的危险度 <2 分为低度;2~6分为中度; >6 分为高度^[14]。

1.5 统计学分析

应用SPSS 11.0软件进行统计分析。正态分布定量资料的描述以 $\bar{x}\pm s$ 表示,计数资料组间比较采用 χ^2 检验。计算曲线下面积(area under the curve, AUC),AUC以 $A\pm S_E$ 表示,行Z检验比较。取 $\alpha=0.05$ 。

2 结果

2.1 Wells 量表评分对肺栓塞可能性的影响

65例高度怀疑肺栓塞患者中,分别通过肺动脉造影、CTPA、肺通气灌注扫描或灌注扫描提示高度可能而获得临床诊断,最终排除可疑肺栓塞患者21例,按照Wells评分对肺栓塞危险度的临床界值标准,Wells评分<2分肺栓塞可能性33.3%(8/24),2~6分87.2%(34/39),6分以上100%(2/2),评分增加肺栓塞可能性增大($P=0.000$;表1)。

表1 Wells评分与肺栓塞可能性的关系

Table 1 Association of the Wells score with the probability of PE

Score	n	PE	Non-PE	PPE(%)	Sen(%)	Spe(%)
0.0	6	3	3	50.0	93.2	14.3
1.0	7	4	3	57.1	84.1	28.6
1.5	11	1	10	9.1	81.8	76.2
2.5	8	6	2	75.0	68.2	85.7
3.0	7	6	1	85.7	54.5	90.5
4.0	9	9	0	100.0	34.1	90.5
4.5	9	7	2	77.8	18.2	100.0
5.0	1	1	0	100.0	15.9	100.0
5.5	5	5	0	100.0	4.5	100.0
6.5	1	1	0	100.0	2.3	100.0
7.0	1	1	0	100.0	0.0	100.0
Total	65	44	21	67.7		

PE: pulmonary embolism; PPE: probability of PE; Sen: Sensitivity; Spe: specificity; PE distribution test, $\chi^2 = 20.682$, $P = 0.000$

2.2 修正的 Geneva 评分对肺栓塞可能性的影响

根据修正的 Geneva 评分判断肺栓塞危险度的标准:低危0~3分22.2%(4/18);中危4~10分82.1%(32/39);高危 ≥ 11 分100%(8/8)。肺栓塞可能性大小与 Geneva 评分高低有关($\chi^2 = 24.512$, $P = 0.000$;表2)。

2.3 ROC 曲线评价 Wells 和 Geneva 评分对肺栓塞的预测价值

以 Wells 评分和 Geneva 评分分值为检测变量。以分组为状态变量,通过 SPSS 软件绘制 ROC 曲线。以曲线上灵敏度、特异度之和最大为最佳临界点。Wells 评分诊断肺栓塞的 ROC 曲线下面积 AUC 0.785 ± 0.060 ($P = 0.000$),最佳分界值2分

表2 修正的 Geneva 评分对肺栓塞可能性的影响

Table 2 Effect of the revised Geneva score on the probability of PE

Score	n	PE	Non-PE	PPE(%)	Sen(%)	Spe(%)
0.0	3	1	2	33.3	97.7	9.5
1.0	2	1	1	50.0	95.5	14.3
2.0	2	0	2	0.0	95.5	23.8
3.0	11	2	9	18.2	90.9	66.7
4.0	4	3	1	75.0	84.1	71.4
5.0	6	2	4	33.3	79.5	90.5
6.0	5	3	2	60.0	72.7	100.0
7.0	11	11	0	100.0	47.7	100.0
8.0	5	5	0	100.0	36.4	100.0
9.0	5	5	0	100.0	25.0	100.0
10.0	3	3	0	100.0	18.2	100.0
11.0	2	2	0	100.0	13.6	100.0
12.0	1	1	0	100.0	11.4	100.0
13.0	1	1	0	100.0	9.1	100.0
14.0	1	1	0	100.0	6.8	100.0
15.0	2	2	0	100.0	2.3	100.0
16.0	1	1	0	100.0	0.0	100.0
Total	65	44	21	67.2		

PE: pulmonary embolism; PPE: probability of PE; Sen: Sensitivity; Spe: specificity; PE distribution test, $\chi^2 = 24.512$, $P = 0.000$

(据表1,在该处可使灵敏度和特异度之和最大,达到158.0%),以 ≥ 2 分预测肺栓塞,其敏感性81.8%,特异性76.2%;Geneva评分ROC的AUC为 0.900 ± 0.038 ($P = 0.000$),最佳分界值6.5分(据表2,在该处可使灵敏度和特异度之和最大,达到172.7%),以 ≥ 6.5 分预测肺栓塞的敏感性为72.7%,特异性100%(图1)。比较Wells和Geneva曲线下面积,计算正态离差值 $Z = 2.14$, $P < 0.05$,尽管Geneva的敏感性低于Wells评分,但曲线下面积比较提示Geneva预测肺栓塞的特异性和敏感性综合评价较Wells评分优。

3 讨论

肺栓塞临床漏误诊率高达40%~100%^[15-18]。本研究总误诊率约67.4%,我们发现误诊疾病多为比较熟悉的常见疾病如肺炎、冠心病、心衰和胸膜炎等,与国内文献报道基本一致,但误诊肺炎比例超过了冠心病。对可疑肺栓塞病人进行量化的评分系统评价,对肺栓塞早期诊断和减少误诊有

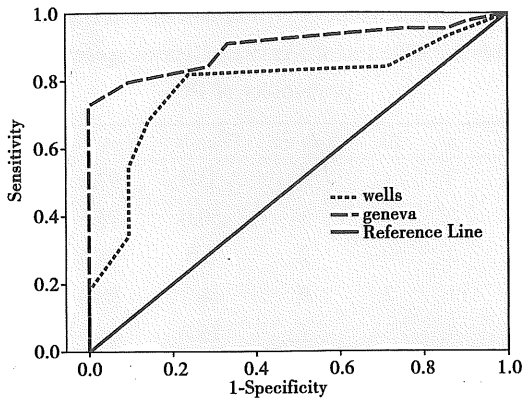


图1 Wells和Geneva评分预测肺栓塞的ROC曲线
Fig.1 The ROC curve predicting PE by the Wells and Geneva scores

积极意义。

1998年, Wells等^[14]首先制定后经改进的预测急性肺栓塞的评分方法,发现7个主要变量(静脉血栓史、心动过速、近期手术或制动、DVT的症状和体征、咯血和恶性肿瘤)与肺栓塞有关,在低度危险时,肺栓塞的可能性为3.6%、中度危险20.5%,高度危险为66.7%,该量表仅需要病史和体征,有一项指标“除肺栓塞外其它诊断可能性小(3分)”具有很大主观性^[14]。但不少资料已经证明其具有较好的临床符合率^[19-20]。我们的研究发现Wells评分的危险度分层,随着危险度增高肺栓塞诊断的可能性愈大。中度危险组肺栓塞为87.2%,而高度危险肺栓塞达到100%。

2001年 Wicki等^[13]制定的Geneva量表包括急性肺栓塞的危险因素(年龄、既往患过PE/DVT病史,近期手术),体征(心率)和辅助检查包括动脉血气分析和胸片,减少了主观判断的误差。在低度危险约10%患者确诊肺栓塞,高度危险有81%患者确诊肺栓塞。但是动脉血气和心率稳定性不佳,因阅片者技术水平不同会干扰对胸片结果的判断。Le Gal提出修正的Geneva评分系统,在新评分系统中新增恶性肿瘤、单侧下肢痛、咯血、下肢深静脉触痛和单侧水肿;取消原有的血气分析和胸片,减少不稳定因素对结果的影响,调查发现中危组28%诊断为肺栓塞,高危74%为肺栓塞。Guimarães等^[21]回顾性研究发现Geneva和Wells量表均有63.9%的诊断符合率, Ulukavak等^[22]研究发现低度危险者,用Wells和Geneva预测的肺栓塞符合率分别为5%和64%,中危为90%和80%,高危均为100%,ROC曲线证明Wells评分优

于Geneva对肺栓塞的预测。Calisir等^[10]报道Wells评分较修正的Geneva评分可能更准确,前者适合住院和急诊病人,后者可以用在高度怀疑的急诊病人。我们的研究提示两种评分方法对肺栓塞均有良好预测效果,随着危险度的增高,肺栓塞的发生率上升。Wells评分简便,但部分项目主观性很强,Geneva的可操作性好,多为客观指标。依据ROC曲线下面积的比较Geneva预测肺栓塞的特异性和敏感性总体上好于Wells评分,与Iles等^[23]的研究相似,因为Geneva评分较少受到临床经验的干扰,例如究竟如何判断Wells的“除肺栓塞外其它诊断可能性小”,因分值高(3分)对临床经验不足者明显影响危险度的评分,Geneva较Wells增加危险因素如骨折和老龄,临床上可以将两种评分方法结合使用,提高肺栓塞的早期诊断水平,尤其在急诊室和基层社区医院,以及不适合搬动作特殊检查者。

根据Wells以及Geneva评分的高低结合D-二聚体检测^[24]非常有利于排除低度危险的肺栓塞患者,对中高危患者条件允许时进一步作CT肺动脉造影和深静脉造影(CTPA-CTV),将显著降低肺栓塞的漏误诊率^[16-17]。

参考文献:

- [1] Dismuke S, Wagner E. Pulmonary embolism as a cause of death. The changing mortality in hospitalized patients [J]. JAMA, 1986, 255(15):2039-2042.
- [2] Horlander KT, Mannino DM, Leeper KV. Pulmonary embolism mortality in United States, 1979-1998: an analysis using multiple-cause mortality data [J]. Arch Intern Med, 2003, 163(14):1711-1717.
- [3] 贾卫滨,张春秀,项志敏. 中国肺动脉栓塞误诊近四年文献分析 [J]. 中华心血管病杂志, 2006, 34(3): 277-280.
- [4] British Thoracic Society Standards of Care Committee Pulmonary Embolism Guideline Development Group. British Thoracic Society guidelines for the management of suspected acute pulmonary embolism [J]. Thorax, 2003, 58(6):470-483.
- [5] Wells PS, Anderson DR, Rodger M, et al. Excluding pulmonary embolism at the bedside without diagnostic imaging: management of patients with suspected pulmonary embolism presenting to the emergency department by using a simple clinical model and D-dimer [J]. Ann Intern Med, 2001, 135(2):98-107.

- [6] Musset D, Parent F, Meyer G, et al. Diagnostic strategy for patients with suspected pulmonary embolism: a prospective multicentre outcome study [J]. *Lancet*, 2002, 360(9349): 1914-1920.
- [7] Perrier A, Roy PM, Aujesky D, et al. Diagnosing pulmonary embolism in outpatients with clinical assessment, D-dimer measurement, venous ultrasound, and helical computed tomography: a multicenter management study [J]. *Am J Med*, 2004, 116(5): 291-299.
- [8] Perrier A, Desmarais S, Miron MJ, et al. Non-invasive diagnosis of venous thromboembolism in outpatients [J]. *Lancet*, 1999, 353(9148): 190-195.
- [9] Perrier A, Nendaz MR, Sarasin FP, et al. Cost-effectiveness analysis of diagnostic strategies for suspected pulmonary embolism including helical computed tomography [J]. *Am J Respir Crit Care Med*, 2003, 167(1): 39-44.
- [10] Calisir C, Yavas US, Ozkan IR, et al. Performance of the Wells and Revised Geneva scores for predicting pulmonary embolism [J]. *Eur J Emerg Med*, 2009, 16(1): 49-52.
- [11] 中华医学会呼吸病学分会. 肺血栓栓塞症的诊断与治疗指南 [J]. *中华结核和呼吸杂志*, 2001, 24(5): 259-264.
- [12] Le Gal G, Righini M, Roy PM, et al. Prediction of pulmonary embolism in the Emergency Department: The Revised Geneva Score [J]. *Ann Intern Med*, 2006, 144(3): 165-171.
- [13] Wicki J, Perneger TV, Junod AF, et al. Assessing clinical probability of pulmonary embolism in the emergency ward: a simple score [J]. *Arch Intern Med*, 2001, 161(1): 92-97.
- [14] Wells PS, Anderson DR, Rodger M, et al. Derivation of a simple clinical model to categorize patients probability of pulmonary embolism: increasing the models utility with the simpliRED D-dimer [J]. *Thrombosis and Haemostasis*, 2000, 83(3): 416-420.
- [15] 王惠阁,李炳华,勾小华,等. 肺栓塞误漏诊 30 例分析 [J]. *中国误诊学杂志*, 2007, 7(30): 7298-7299.
- [16] 孔祥奇,马利平,汪凤兰,等. 急性肺栓塞临床特点及误诊因素分析(附 56 例报告) [J]. *临床误诊误治*, 2007, 20(12): 29-30.
- [17] 陈立斌,张建平. 妊娠期及产褥期合并深静脉血栓 5 例报告 [J]. *中山医科大学学报*, 2002, 23(5S): 66-67.
- [18] 赵光焯,王辉宇,赵强. 急性肺栓塞 28 例误诊分析 [J]. *新医学*, 2006, 37(10): 672-673, 681.
- [19] Chagnon I, Bounameaux H, Drahomir A, et al. Comparison of two clinical prediction rules and implicit assessment among patients with suspected pulmonary embolism [J]. *Am J Med*, 2002, 113(4): 269-275.
- [20] Wolf SJ, McCubbin TR, Feldhaus KM, et al. Prospective validation of Wells criteria in the evaluation of patients with suspected pulmonary embolism [J]. *Ann Emerg Med*, 2004, 44(5): 503-510.
- [21] Guimarães M, Oliveira A, Rego A, et al. Pulmonary embolism: The importance of a diagnostic strategy [J]. *Rev Port Pneumol*, 2005, 11(6Suppl 1): 47-48.
- [22] Ulukavak Ciftçi T, Köktürk N, Demir N, et al. Comparison of three clinical prediction rules among patients with suspected pulmonary embolism [J]. *Tuberk Toraks*, 2005, 53(3): 252-258.
- [23] Iles S, Hodges AM, Darley JR, et al. Clinical experience and pre-test probability scores in the diagnosis of pulmonary embolism [J]. *QJM*, 2003, 96(3): 211-215.
- [24] 肖洪广,黄泽红,林诚,等. 肺栓塞患者血浆 D-二聚体与纤维蛋白原联合测定的意义 [J]. *热带医学杂志*, 2005, 5(5): 609-611.

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- 糖尿病患者的葡萄糖激酶基因分子扫描 [J]. *中国糖尿病杂志*, 1995, 3(1): 3-7.
- [10] Wang C, Fang Q, Zhang R, et al. Scanning for MODY5 gene mutations in Chinese early onset or multiple affected diabetes pedigrees [J]. *Acta Diabetol*, 2004, 41(4): 137-145.
- [11] Holmkvist J, Almgren P, Lyssenko V, et al. Common variants in maturity-onset diabetes of the young genes and future risk of type 2 diabetes [J]. *Diabetes*, 2008, 57(6): 1738-1744.
- [12] Cauchi S, Neale KT, Choquet H, et al. The genetic susceptibility to type 2 diabetes may be modulated by obesity status: implications for association studies [J]. *BMC Med Genet*, 2008, (9): 45-49.
- [13] Doria A, Yang Y, Malecki M, et al. Phenotypic characteristics of early-onset autosomal-dominant type 2 diabetes unlinked to known maturity-onset diabetes of the young (MODY) genes [J]. *Diabetes care*, 1999, 22(2): 253-261.

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